User manual

Wireline WL66/50

Doc. no.: WL66/50e.06

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1. Introduction

The Sandvik Wireline System (WL) is available in dimensions of 46, 56, 66 and 76 mm. There are two different versions of WL56, where the differences are primarily the weight of the drill rod and the inner dimension, which permit different core dimensions. The 66 and 76 mm dimensions include a triple variant with an extra inner tube.

Table 1: Different Wireline Systems

System	Hole dimension	Core dimension	Tube ext./ int. dim.	Tube weight kg/m
WL46	Ø47.0	Ø28.8	Ø43.2/35.2	3.9
WL56/42	Ø56.8	Ø41.2	Ø53.2/47.2	3.8
WL66/50	Ø67.1	Ø50.5	Ø63.9/57.0	5.1
WL66-3	Ø67.1	Ø45	Ø63.9/57.0	5.1
WL76	Ø76.3	Ø57.5	Ø73.2/64.4	7.5
WL76-3	Ø76.3	Ø51	Ø73.2/64.4	7.5
WL103	Ø102.8	Ø80	Ø98/88.8	10.6

1.1 Description

WL66/50 is a thinwall Wireline System adapted to the metric system. This makes it possible to switch between the T, TT and WL Systems whenever necessary.

The WL System is intended to be used for drilling in all directions without the need for extra accessories. An overshot is used to obtain the best results from the system, which is designed to be pumped into the hole (see chapters “Overshot for Pumping In” on page 22 and “Stuffing Box” on page 24). This overshot can be used in all directions, even with a high water pressure.

For recovery in drill holes inclined at an angle of more than 60° from the horizontal plane there is a free falling overshot (see chapter “Free Falling Overshot” on page 18), which is provided with wheels. The same overshot can be fitted with a special lowering device for use in downward holes with water loss, so-called dry holes.

The WL core barrels are available in lengths of 1.5 and 3.0 m, but can be extended to 4.5 and 6.0 m, please contact Sandvik for further information.

Drill bits for WL66/50 are manufactured as standard with an external diameter of 66.8 and reaming shell of 67.1 mm.

Remark

When drilling with an oversize bit and reaming shell an oversized drill rod connection should be used.

2. Safety Instructions

WARNING

When handling Wireline it is important to inspect the wire visually, since a broken wire can cause injury to personnel or damage the equipment. When the wire starts to look damaged it should be shortened.

WARNING

There is a risk of injury from the wire during Wireline drilling. This risk is greatest between the Wireline windlass and the top of the mast. Do NOT enter this area when the wire is in operation. There is also a risk of getting trapped round the drum, in the wire spreader on the drum, and at the pulley on the mast. Remember that the wire can split up, which can lead to severe cut injuries. Never grip the wire when it is in motion.

WARNING

When handling Wireline the inner tube can release on detachment and come sliding out of the hole at high speed.

WARNING

When the core barrel is emptied from the drill bit there is a risk of injuring the hands and fingers. The core can come sliding out from the core barrel at high speed. NEVER place the hands and fingers under the core barrel, place them is such a way that the core can pass without causing injury.

WARNING

The drill rods are exposed to a higher load and heavier vibrations during upward drilling. The risk of drill rods braking when they are worn is therefore increased. If the rods break during the drilling the rod holder will be open, which causes the rod string to slide out from the hole. For this reason, place the panel at a safe distance from the barrier.

WARNING

The risk of injury increases more than normal during upward drilling.

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WARNING

Cuff wrenches must under NO CIRCUMSTANCES be used on the rods when they are rotated by means of the machine. They can come loose and injure the operator, or cause pinch injuries on the hands and fingers.

WARNING

Remember to secure the machine in a reliable manner when it is anchored to the rock. Make sure to inspect the attachment during operation to make sure the machine does not come loose.

WARNING

Remember that you should have the opportunity to reach, or have regular contact with those around you if you should become injured when using the machine.

2.1 Recommendations

- Check the threads on the drill rods regularly. If the threads are damaged they can damage other rods they are attached to. Pay extra attention to the water swivel tube.
- Make sure that the threads are properly engaged with each other before the rods are screwed together by means of the machine.
- Make sure that the rod does not break during threading (rod support and guides).
- Make sure to lubricate the threads.

Note

Always lubricate the drill rod threads with grease that is suitable for high pressure. Special thread lubricant is best.

- Avoid rotating so fast that the threads are “knocked” together.
- Check that the threads are free from dirt and undamaged.
- The continuous feed pressure should not exceed 3.5 tons.
- Avoid too many “tough” shapening. Use a lower water flow instead for hard rock.
- Make sure that lifting function on the machine functions during the rod threading, and that the “float position” works.
- If the “threading” on one rod should get damaged during making of joint, both rods should be replaced.

2.2 Wire Handling

2.2.1 Winding of wire

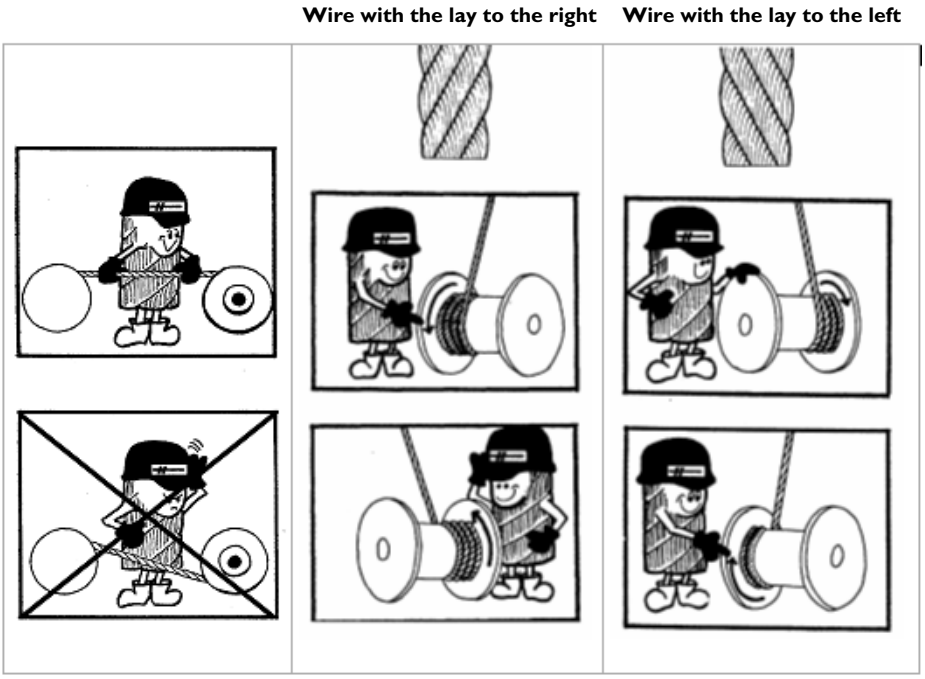


Figure 1. Wire handling

3. Outer Core Barrel, complete

The core barrel latch housing is constructed so that it can be guided up and therefore minimize the hole deviation.

3.1 Fitting of Outer Core Barrel

The outer landing ring (4) is fitted in the adapter tube's (5) female thread, with the internal collar facing upwards.

The latch housing (3) locks the landing ring (4).

Remark

The landing ring should be replaced after drilling approx. 500 m.

The latching ring (2) is fitted on the latch housing's (3) female thread.

The drill rod adaptor (1) locks the latching ring.

The latching ring can be reversed after a period of use if the edge has become worn.

When extending the core barrel an outer tube coupling (6) or a reaming shell (9) is fitted between the outer tubes.

The outer tubes are of standard lengths 1.5 m or 3.0 m (Se "Extendable Outer Core Barrel WL66/50" på sidan 9.).

On those occasions when the outer tube is taken up for inspection a careful check should be made that the outer landing ring and latching ring are in place and undamaged.

The inner tube is locked upwards in the outer tube in that the core barrel head latches support the latching ring. The inner tube is fixed downwards in that the outer landing ring has a smaller diameter than the core barrel head's landing ring.

The tensile force when breaking the core is transferred from the core lifter case to the drill bit in that the inner tube connection is flexible in the axial plane (the core lifter case "rests" on the bit). The play between drill bit and core lifter case can be adjusted for different types of drilling.

Before recovery the core is broken and the core barrel lifted 3-6 m. This prevents drill cuttings that drop back into the hole collecting inside the outer tube.

The inner tube can be stabilized by a stabilize ring (601 222 555), which is placed in drill bit thread and padlock with reaming shell.

3.2 List of spare parts – Outer Core Barrel

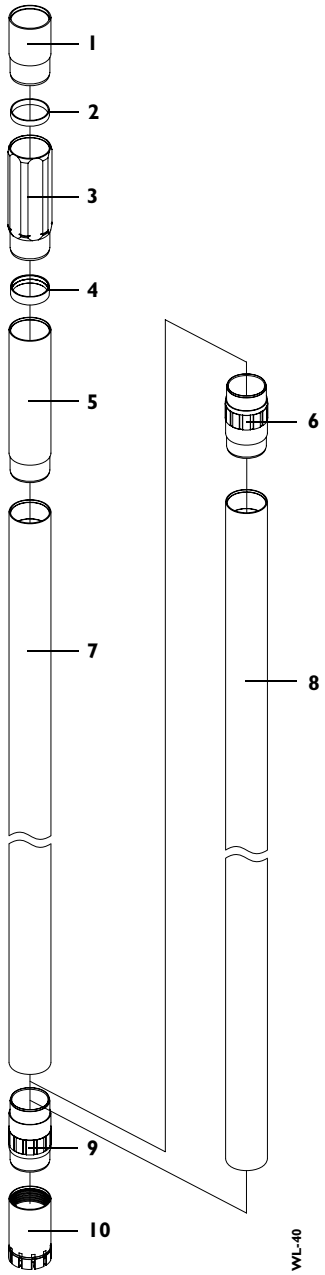


Table 2: List of spare parts, Outer Core Barrel

No.	Quantity	Part	Remarks	Part no.
1	1	Drill rod adaptor		601 222 553
2	1	Latching ring		601 222 552
3	1	Latch holder		601 222 551
4	1	Outer landing ring		601 222 781
5	1	Adaptor tube	L = 237 mm	601 222 780
6	1**	Outer tube coupling		601 222 689
7	*	Outer tube, 1.5 m	L = 1552 mm	601 222 534
7.1	*	Outer tube, 3.0 m	L = 3052 mm	601 222 533
8	*	Extension tube, outer tube, 1.5 m	L = 1552 mm	601 222 534
8.1	*	Extension tube, outer tube, 3.0 m	L = 3052 mm	601 222 533
9	1	Reaming shell		
10	1	Drill bit		

* Standard outer tube (7) also used as extension tube (8).

** The outer tube coupling can be replaced with a reaming shell.

Table 3: Extendable Outer Core Barrel WL66/50

Length (m)	Quantity	Outer tube standard	Quantity	Extension tube outer tube	Part no. compl. tube
1.5	1	601 222 534	-	-	601 222 670
3.0	1	601 222 533	-	-	601 222 671
4.5/2	1	601 222 533	1	601 222 534	601 222 672
6.0/2	1	601 222 533	1	601 222 533	601 222 673

4. Inner Core Barrel, complete

A standard inner tube is used to extend the inner tube. Se “Extendable Inner Core Barrel WL66/50” på sidan 11.

Always use cuff wrenches when working with the inner tube (2) and core lifter case (5). Check the function of the core lifter spring (4) after each recovery. If the inner tube is clamped oval, or otherwise damaged, the inner tube can stick in the drill rod or outer landing ring. A landing ring for the core barrel head can be used to check that the inner tube has not been deformed.

Table 4: Estimated times for pumping in Inner Core Barrel, WL66/50

System	Volume drill rod	Speed with water flow of 40 l/min.	Time to 100 m with water flow of 40 l/min.
WL46/29	1.0 l/m	40 m/min.	2.5 min.
B60	1.6 l/m	25 m/min.	4 min.
WL56/42	1.7 l/m	24 m/min.	4 min.
WL66/45	2.6 l/m	16 m/min.	6 min.
WL66/50.5			
WL76/51	3.3 l/m	12 m/min.	8 min.
WL76/57.5			

The pumping in time for the inner core barrel is part of the total handling time. If the Sandvik System with pumping of the inner tube or lifter is used it is possible to obtain an indication of when they are in position. This ensures significant time savings since the drilling or recovery of the inner core barrel can be started immediately. How long the pumping takes depends on how much water can flow in the gap between the core barrel and hole wall. This time can be reduced by increasing the pressure of the water, or increasing the gap between the drill rod and hole wall. If the gap is increased between the drill rod and hole this increases the risk of deviated holes.

4.1 List of spare parts – Inner Core Barrel, complete

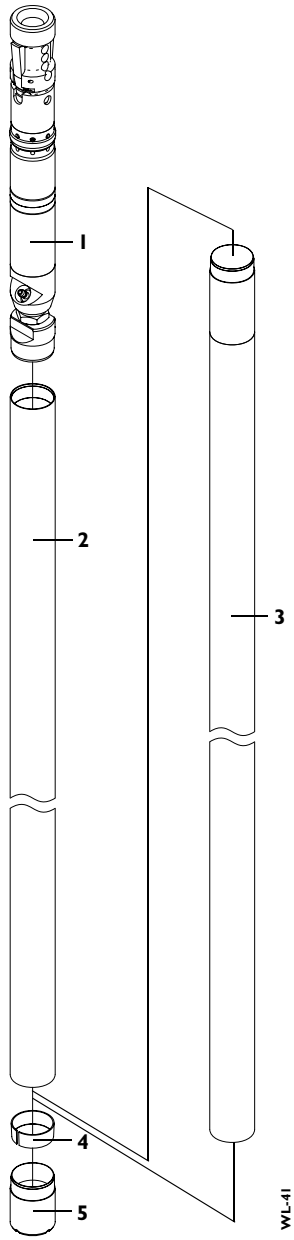


Table 5: List of spare parts, Inner Core Barrel, complete WL66/50

No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 504
2	1	Inner tube 1.5 m	L = 1544 mm	601 222 517
2.1	1	Inner tube 3.0 m	L = 3044 mm	601 222 518
3	1	Extension tube, inner tube 3.0 m	L = 3137 mm	601 222 634
4*	1	Core lifter spring, standard		601 222 520-2
5	1	Core lifter case		601 222 519

* Can also be find in flat version with part no. 601 222 520.

Table 6: Extendable Inner Core Barrel WL66/50

Length (m)	Quantity	Inner tube standard	Quantity	Extension tube inner tube	Part no. compl. tube
1.5	1	601 222 517	-	-	601 222 674
3.0	1	601 222 518	-	-	601 222 675
4.5	1	601 222 517	1	601 222 634	601 222 676
6.0	1	601 222 518	1	601 222 634	601 222 677

5. Inner Core Barrel, Triple system, Complete

The Wireline 66/46 triple system gives a core on Ø46 mm.

The inner tube is supplemented with a plunger, split tube, core lifter case, core lifter spring and spacer. The core lifter spring is put into the core lifter case from behind. The spacer is then fitted with the bevel forwards and the core barrel case is screwed tight on the inner tube.

The core barrel case is available in two versions, either front flushing or not front flushing.

Note

There is special drill bit for these different triple variation.

When emptying the inner tube the core barrel case is screwed off the inner tube and a hose with a quick coupling is connected to the adapter on the core barrel head. The separated inner tube is then pumped out with the core.

Hose assembly includes:

- Hose with part no 300 027 169
- Adapter with part no 300 020 350
- Adapter with part no 300 027 168
- Quick connection with part no 300 027 154

Note

The outer tube is standard and the drill bit is the only one which need to be changed.

5.1 List of spare parts – Inner Core Barrel, Triple system, Complete

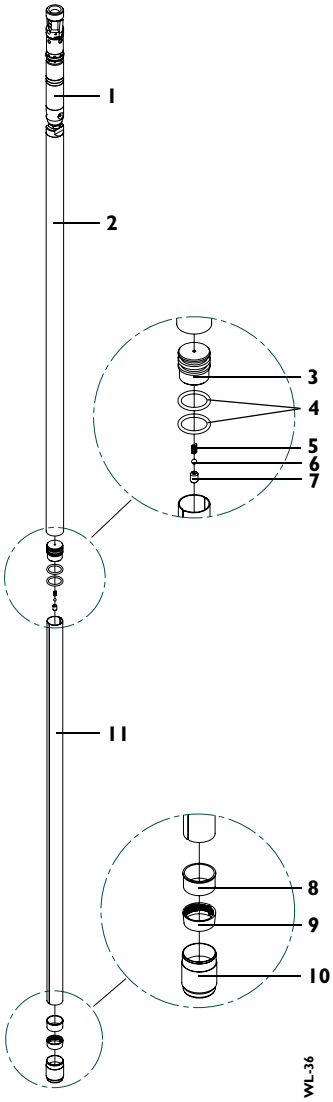


Table 7: List of spare parts, Inner core barrel, complete, WL66/46

No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 504
2	1	Inner tube 1.5 m	L = 1544 mm	601 222 517
2.1	1	Inner tube 3.0 m	L = 3044 mm	601 222 518
3	1	Piston		601 222 574
4	2	O-ring	40.65 x 5.33	300 027 260
5	1	Spring		300 025 743
6	1	Rubber ball		300 025 745
7	1	Screw		601 222 513
8	1	Spacer		601 222 577
9	1	Core lifter spring		601 222 578
10	1	Core lifter case	Front flushing	601 222 584
10.1	1	Core lifter case	Standard	601 222 579
11	1	Triple inner tube	L = 1.5 m, divided	601 222 575-1
11.1	1	Triple inner tube	L = 3 m, divided	601 222 575-2

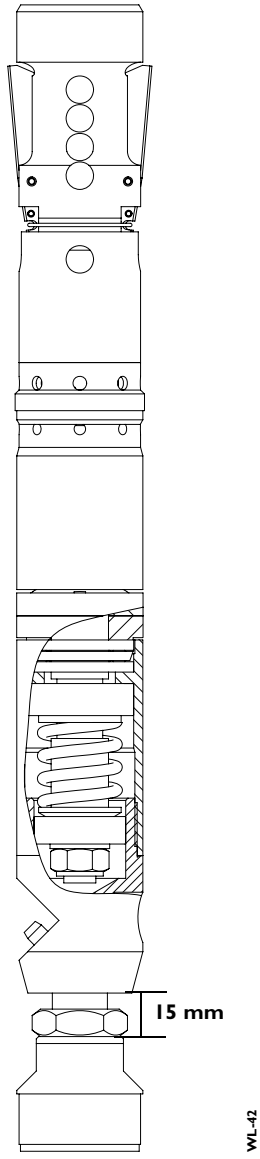
Table 8: Extendable Inner Core tube WL66/46

Length (m)	Quantity	Inner tube	Quantity	Inner tube, divided	Part no. compl. tube
1.5	1	601 222 517	1	601 222 575-1	601 222 680
3.0	1	601 222 518	1	601 222 575-2	601 222 681

Tabell 9: Extendable Inner Core tube WL66/46 Front flushing

Length (m)	Quantity	Inner tube	Quantity	Inner tube, divided	Part no. compl. tube
1.5	1	601 222 517	1	601 222 575-1	601 222 581-3
3.0	1	601 222 518	1	601 222 575-2	601 222 581-4

6. Core Barrel Head



Core barrel head has part no. 601 222 504.

Core barrel head with shut off valve has part no. 601 222 504-2.

Check that the latches (2) move freely and that the O-ring (1) and tubular pin (3, 4) are undamaged.

When checking the latches the lifter tip is inserted in the core barrel head. The back edge of the lifters should then be inside the outer dimension of the latch housing. If not, the tubular pin is probably crooked or the hole in the latch worn.

When fitting the release valve (9) the spring (10) must be turned with the rivet from the release valve.

Note

Make sure that the cylindrical pin (11) does not catch in the thread and can easily be moved in its slot.

Note

Lubricate the core barrel head with grease every time it is taken up.

Use enough grease to ensure that fresh grease is pressed out through the bearing housing (18). Oil in the release valve through the hole at the landing ring (7). Wipe off all surplus grease.

If the release valve jams there is a reamer (part no. 300 025 325) to clean the release valve seat.

The landing ring core barrel head is fitted so that the hole is turned backwards on the valve housing (12). Fit the latch housing (5) [with spacer washer (6)] on the valve housing, and tighten. Screw the landing ring core barrel head to the latch housing, and tighten. It will now function as a lock nut.

When fitting the bearing unit it should be noted that the thrust ball bearing (17) must be turned correctly for the grease to pass through the bearing.

Note

The thrust ball bearing (17) washers have different hole diameters. The washer with the smallest hole diameter is fitted upwards.

To optimize drilling in different types of rock it may be necessary to adjust the gap between the bit and core lifter case. This is done be releasing the lock nut on the inner tube connection (30) and adjusting the gap between the inner tube connection (30) and the lower bearing housing (28).

The recommended setting is 15 mm.

6.1 List of spare parts – Core Barrel Head 601 222 504, – Core Barrel Head with shut off valve 601 222 504-2

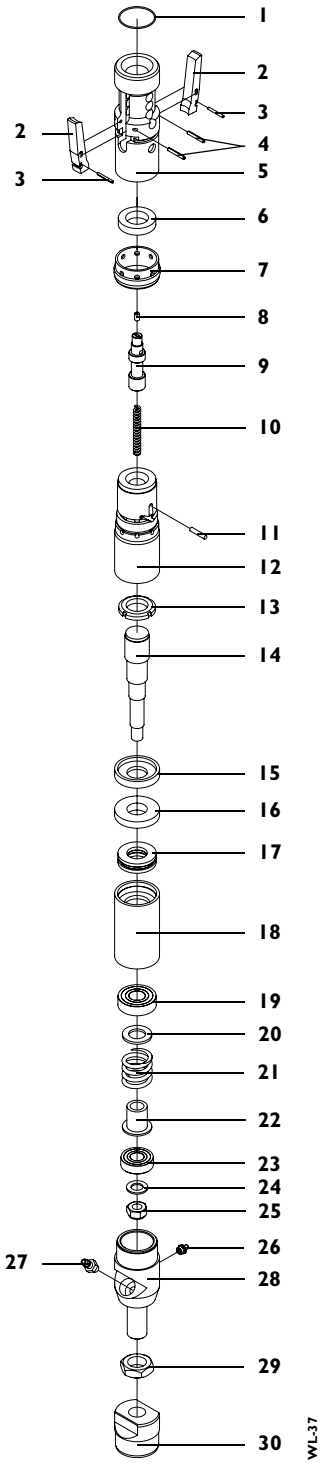


Table 10: List of spare parts, Core Barrel Head

No.	Quantity	Part	Remarks	Part no.
1	1	O-ring	39.2 x 3.0	300 012 691
2	2	Latch		601 222 419
3	2	Tubular pin	3.0 x 26	300 015 310
4	2	Tubular pin	4.0 x 30	300 015 967
5	1	Latch housing		601 222 509
6	1	Spacer		601 222 507
7	1	Landing ring		601 222 508
8	1	Stop screw		300 012 531
9	1	Release valve		601 222 344
10	1	Spring		601 222 378
11	1	Cylindrical pin		300 022 671
12	1	Valve housing		601 222 505
13	1	Nut		300 013 335
14	1	Shaft		601 222 522
15	1	Thrust washer		601 222 524
16	*	Spacer		601 222 523
16.1	*	Shut off valve		601 222 573
17	1	Ball bearing		300 013 538
18	1	Upper bearing housing		601 222 510
19	1	Ball bearing		300 020 610
20	1	Washer		300 012 560
21	1	Spring		300 025 744
22	1	Bushing		601 222 506
23	1	Ball bearing		300 013 548
24	1	Washer		300 012 556
25	1	Nut		300 012 513
26	1	Grease nipple	R 1/8"	300 015 242
27	1	Quick coupling		300 027 153
28	1	Lower bearing housing		601 222 511
29	1	Nut		300 025 065
30	1	Inner tube connection		601 222 512

* A spacer is normally used, but it can be changed to a shut off valve.

6.2 Functional description for pumping

In the core barrel head there is a release valve (9), which before pumping in should be locked in a special pumping position. Insert a screwdriver in the latch housing, press the release valve forward and turn a quarter of a turn. The release valve will now be locked in its pumping position and the pumping in of the inner tube can now be started. When the inner tube is in position the water pressure increases powerfully and the flow of water is stopped. This is an indication that the inner tube is in it locked position. With the retention of the high water pressure for a few seconds the release valve will be pressed forward and released from its locked position.

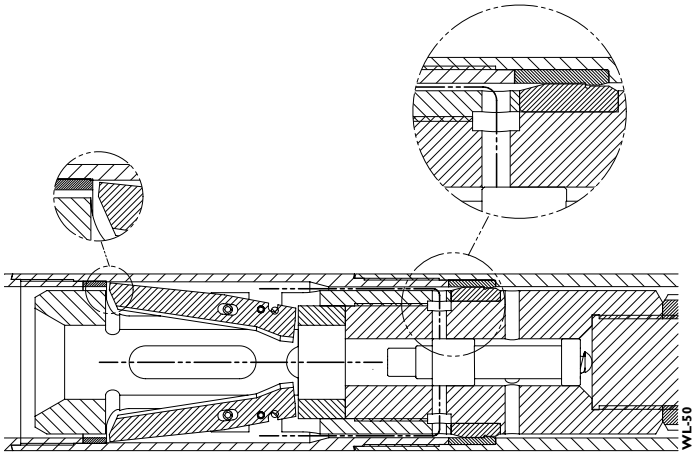


Figure 2. Core barrel head

After the pump flow has been stopped and the water pressure completely drained, the spring will press the release valve upwards. This forms a free passage for the flushing water, and the pumping for the drilling can be started.

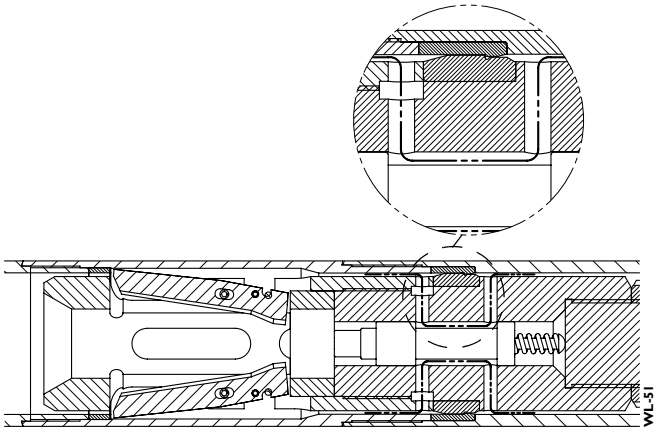
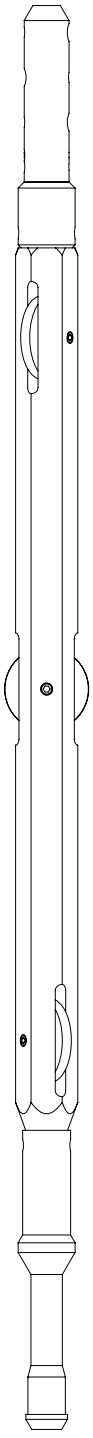


Figure 3. Core barrel head

7. Free Falling Overshot



Free falling overshot has part no. 601 222 796.

The overshot has a swivel (1, 4, 6) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approx. 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

Remark

When double shear pins are fitted the breaking point load increases to approx. 3 tons.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

Fit the bearing shaft (6) in the bearing housing (4), then fix the wire clamp (1) on the bearing shaft (6) by means of the [shear pin (s) (3)]. Lubricate the surfaces between bearing housing and wire clamp with grease. The bearing housing is then filled with grease before it is fitted on the wire weight by means of the tubular pin (5).

The shear pins should be replaced at regular intervals.

When the lifting tip (10) is led down in the core barrel head the latches are released from the latching ring. When the tip has passed the latches the inner tube is locked to the overshot, and the inner tube can be winched up by means of the wire.

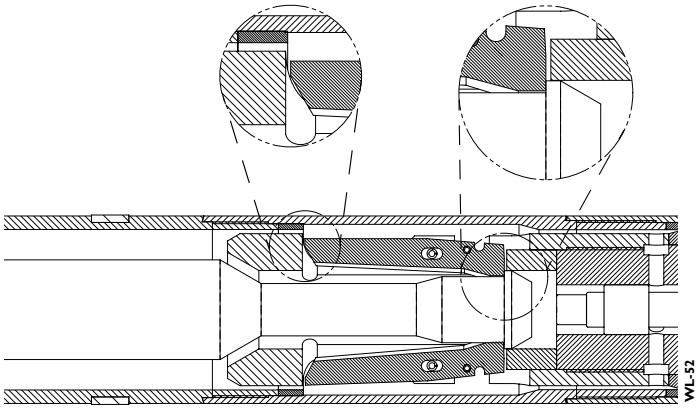


Figure 4. Core barrel head

Note

The lifting tip should be replaced when the edge of the lifting tip begins to be worn.

The lifting tip can if necessary be provided with a joint by fitting a ball joint (see Table 12 on page 19) between the lifting tip (10) and wire weight (9).

7.1 List of spare parts - Free Falling Overshot 601 222 796

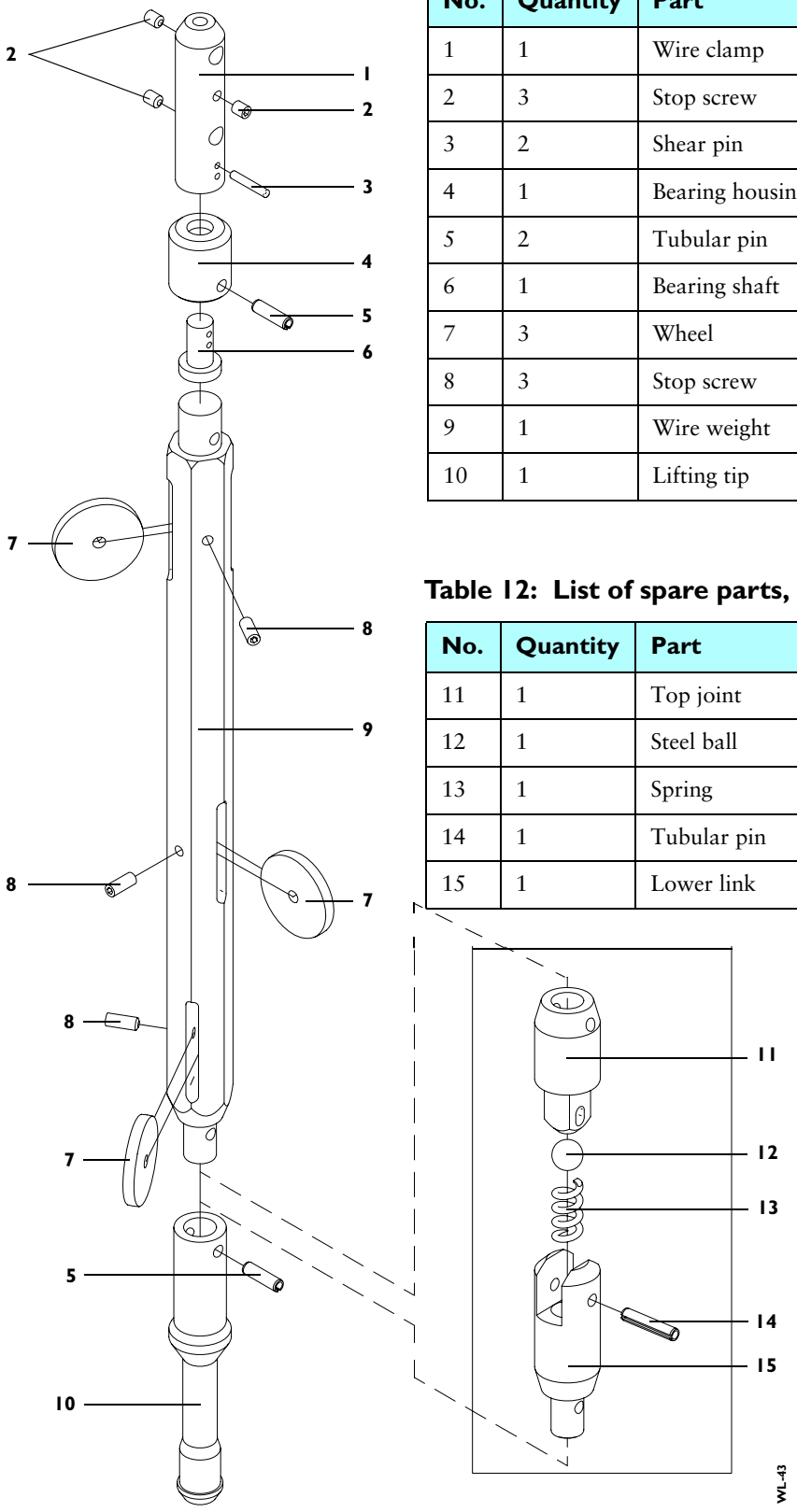


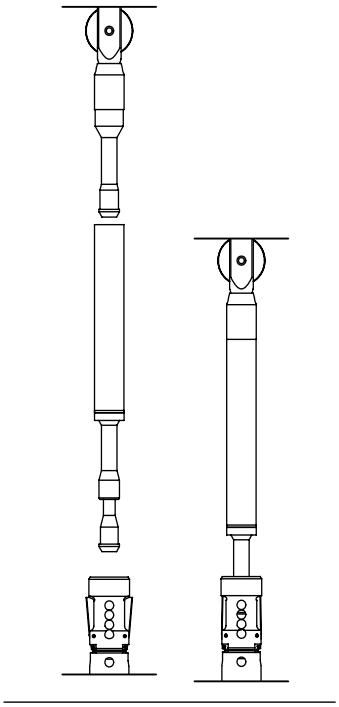
Table 11: List of spare parts, Free Falling Overshot

No.	Quantity	Part	Part no.
1	1	Wire clamp	601 222 692
2	3	Stop screw	300 027 148
3	2	Shear pin	300 025 423
4	1	Bearing housing	601 222 688
5	2	Tubular pin	300 015 732
6	1	Bearing shaft	601 222 693
7	3	Wheel	601 222 535
8	3	Stop screw	300 010 699
9	1	Wire weight	601 222 687
10	1	Lifting tip	601 222 536

Table 12: List of spare parts, Ball joint 601 222 462

No.	Quantity	Part	Part no.
11	1	Top joint	601 222 452
12	1	Steel ball	300 027 125
13	1	Spring	300 027 124
14	1	Tubular pin	300 015 949
15	1	Lower link	601 222 463

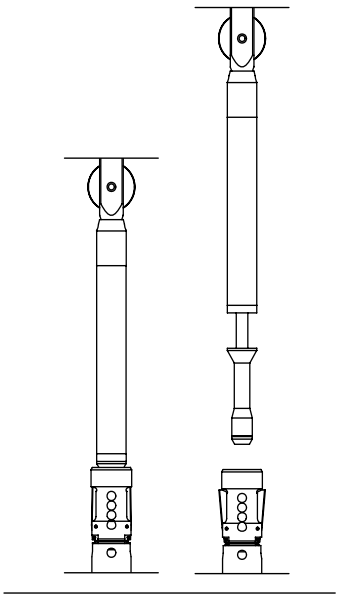
7.2 Safety Lowering Device for Dry Holes 601 222 560



If a hole is dry, a Safety Lowering Device (SLD) should be used to install the inner core barrel assembly into the outer core barrel. This is to avoid high velocity impacts between inner and outer core barrel that may result in damaged equipment.

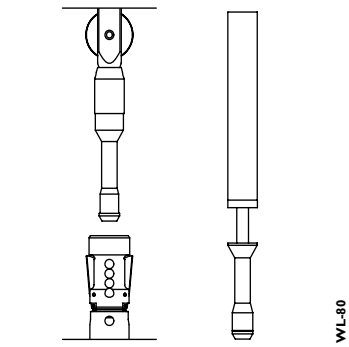
How to assemble and use the SLD:

1. Screw the Extension socket (1) on to the thread on the overshot lifting tip.
2. Lock the Sleeve (4) in upper position by holding the SLD-lifting tip and moving the Sleeve fully backwards.
3. Connect the SLD to the core barrel head of the Inner tube assembly. When the SLD-lifting tip has passed beneath the latches, the inner tube assembly is locked to the SLD.
4. Lower the inner tube assembly into the drill string by means of the overshot.



When the inner tube assembly comes to a halt on the outer landing ring, the overshot will press the Sleeve (4) forward. This will release the latches from the SLD-lifting tip.

When the overshot is pulled upwards, the Sleeve will stay in lower position, enabling the latches to fold out and lock against the latching ring. The overshot can now be hoisted to surface and drilling can begin.



WL-80

When retrieving the inner tube assembly after a completed run, the SLD is removed from the overshot lifting tip and the overshot is hoisted down the drill string as usual.

7.2.1 List of spare parts – Safety Lowering Device for dry holes 601 222 560

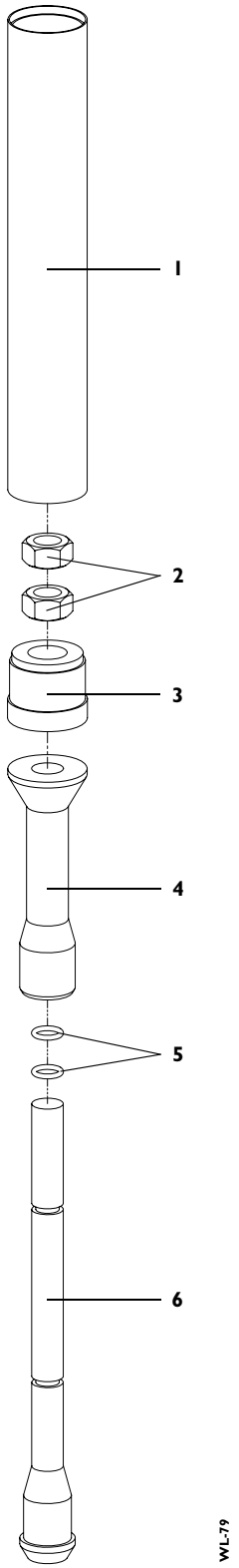
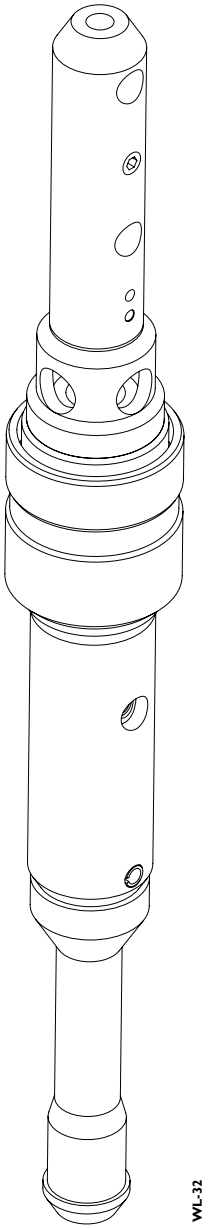


Table 13: List of spare parts, Safety Lowering Device

No.	Quantity	Part	Remarks	Part No.
1	1	Extension socket		601 222 812
2	2	Nut	M6M M16	300 021 496
3	3	Nut		601 222 557
4	1	Sleeve		601 222 559
5	2	O-ring		300 012 668
6	1	Lifting tip		601 222 556

8. Overshot for Pumping In



Overshot for pumping in has part no. 601 222 699.

The overshot has a swivel (1, 4, 5) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approx. 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

Remark

When double shear pins are fitted the breaking point load increases to approx. 3 tons.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

The bearing shaft (5) is fitted together with the bearing housing (4) and lubricated internally with grease. The shaft should be able to turn without problem, after which the wire clamp can be fitted by means of the shear pin(s).

The shear pins should be replaced at regular intervals.

The guide (8) and seal (7) are fitted on the valve housing (9), and the bearing housing (4) is tightened. The seal is self-adjusting.

The seal on the overshot for the pumping in seals to the drill rod. This means that a check should be made to see that the drill rods are free from rust on the inside and that no rod joints are damaged. Rusty or damaged rods will damage the seal.

The overshot is provided with a valve that opens automatically on recovery.

The O-rings (10) are fitted on the valve housing (9) and lubricated with a thin grease. The seal housing (12), spring (14) and shaft (15) are pressed together with the valve housing, and tubular pin (11) 8 x 28 is fitted.

Finally the lifting tip is fitted and locked with the tubular pin (13) 8 x 40.

When the lifting tip (16) is led down in the core barrel head the latches are released from the latching ring. When the tip has passed the latches the inner tube is locked to the overshot, and the inner tube can be winched up by means of the wire.

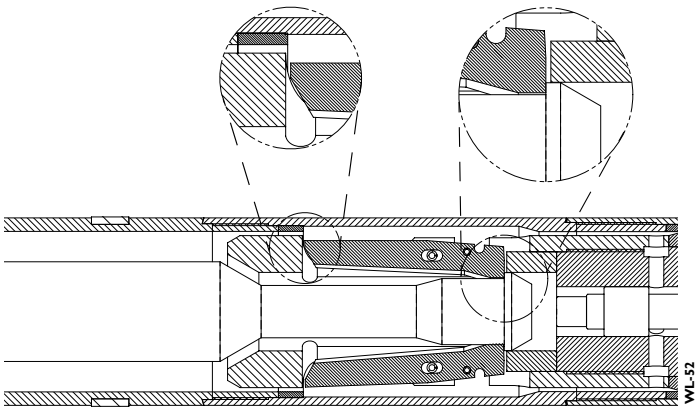


Figure 5. Core barrel head

Note

When the edge of the lifting tip begins to be worn it should be replaced.

8.1 List of spare parts – Overshot for Pumping In 601 222 699

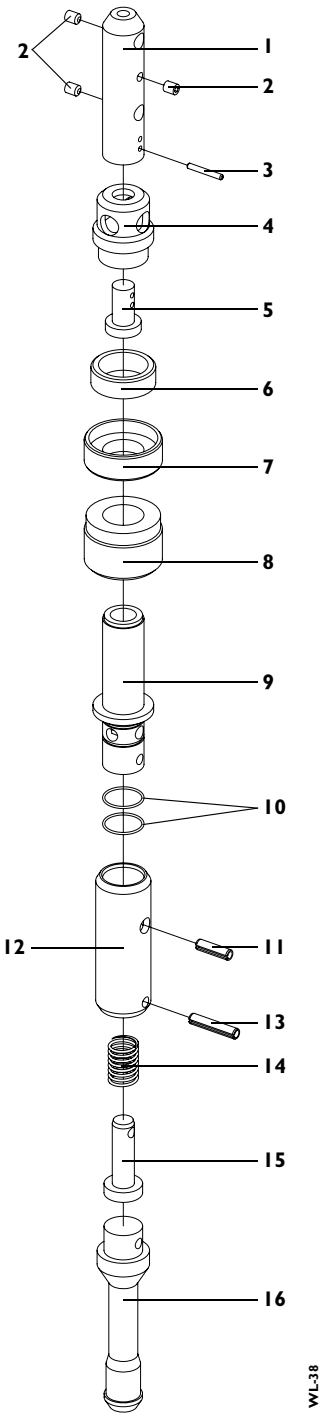
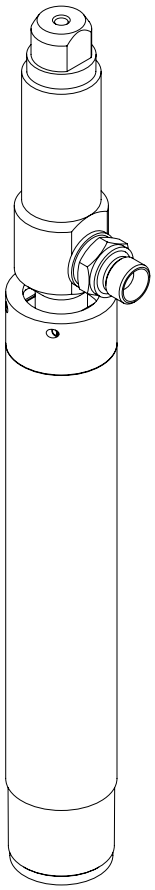


Table 14: List of spare parts, Overshot for Pumping In

No.	Quantity	Part	Remarks	Part no.
1	1	Wire clamp		601 222 692
2	3	Stop screw		300 027 148
3	1	Shear pin		300 025 423
4	1	Bearing housing		601 222 694
5	1	Bearing shaft		601 222 693
6	1	Spacer		601 222 695
7	1	Sealing ring		601 222 698
8	1	Guide		601 222 697
9	1	Valve housing		601 222 725
10	2	O-ring	27.1 x 1.6	300 012 649
11	1	Tubular pin	8 x 28	300 015 732
12	1	Seal housing		601 222 726
13	1	Tubular pin	8 x 40	300 015 974
14	1	Spring		300 010 966
15	1	Shaft		601 222 727
16	1	Lifting tip		601 222 696

9. Stuffing Box



WL-14

Stuffing box has part no. 601 222 690-X.

The stuffing box can be fitted directly on the drill rod by screwing it on by with a pair of tongs.

We recommend that the sealing box, water hose, pump-in overshot and a 750 mm drill rod are fitted together to form a single unit, a “loading tube”. This simplifies handling when retrieving the inner tube. The loading tube can be screwed on the drill string by means of the machine as soon as the water swivel tube has been removed. The stuffing box is designed so that the drill string can be rotated during the pumping. Two water distribution kits are prepared. One for underground (UG) use where the stuffing box is used and one for surface (S) use where there normally is no need for the stuffing box.

Part no. Water distribution kit UG: 803 908 128.

Part no. Water distribution kit S: 803 908 129.

The components of the kits are listed in table 15.

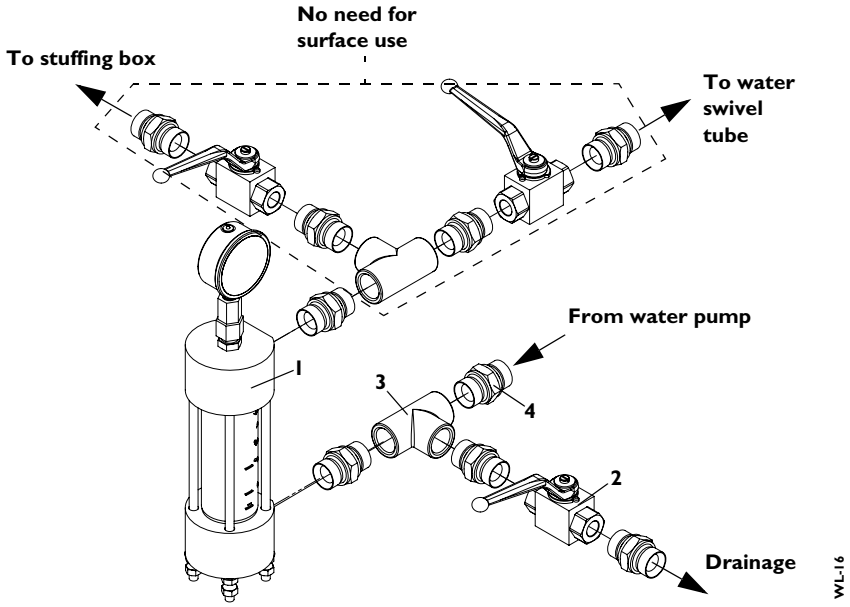


Figure 6. Proposal for water handling

Table 15: List of spare parts, Proposal for water handling

No.	Quantity (UG/S)	Part	Remarks	Part no.
1	1/1	Flow meter		803 908 127
2	3/1	Shut off valve	3/4"	300 013 228
3	9/5	Adapter	3/4"-3/4"	300 013 051
4	2/1	T-adapter	3/4"	300 013 133

9.1 List of spare parts – Stuffing Box 601 222 690-X

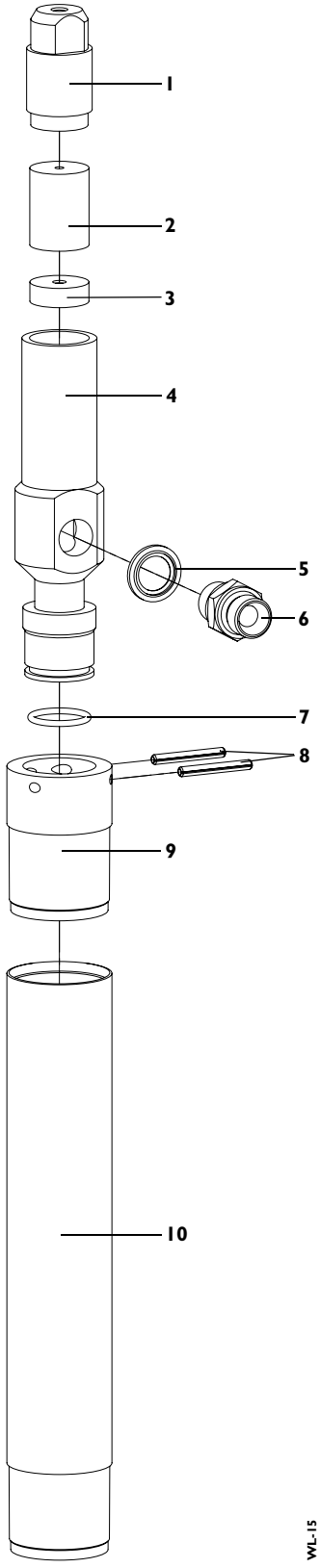


Table 16: List of spare parts, Stuffing Box

No.	Quantity	Part	Remarks	Part no.
1	1	Screw		See Table 17 on page 25
2	1	Seal		See Table 17 on page 25
3	1	Spacer		See Table 17 on page 25
4	1	Seal housing		601 222 635
5	1	Tredo washer		300 012 614
6	1	Adaptor		300 013 048
7	1	O-ring	29.2 x 3.0	300 012 691
8	2	Tubular pin	5 x 40	300 020 641
9	1	Connector		601 222 691
10	1	Drill rod	L = 750 mm	601 222 527

Table 17: Stuffing Box, complete

Wire mm	Screw	Spacer	Seal	Stuffing box
4.4 (11/64")	601 222 638-1	601 222 637-1	601 222 499	601 222 690-1
4.8 (3/16")	601 222 638-2	601 222 637-2	601 222 501	601 222 690-2
6	601 222 638-3	601 222 637-3	601 222 543	601 222 690-3

10. Wireline 66, Component Parts

Drill bit 66.8 - 50.5/Triple 66.8-46.0, Reaming shell 67.1, Drill rod 63.9 - 57.2 mm

Table 18: Wireline 66/50, Component parts

Component Parts	Part no. of the outer tube	Part no. of the inner tube	Part no. complete
Core barrel, complete WL66/50 x 1500	601 222 670	601 222 674	601 222 666
Core barrel, complete WL66/50 x 3000	601 222 671	601 222 675	601 222 667
Core barrel, complete WL66/50 x 4500	601 222 672	601 222 676	601 222 668
Core barrel, complete WL66/50 x 6000	601 222 673	601 222 677	601 222 669
Core barrel, triple system, complete WL66/46 x 1500	601 222 670	601 222 680	601 222 678
Core barrel, triple system, complete WL66/46 x 3000	601 222 671	601 222 681	601 222 679
Core barrel, triple system front discharge, complete WL66/46 x 1500	601 222 670	601 222 581-3	601 222 683
Core barrel, triple system front discharge, complete WL66/46 x 3000	601 222 671	601 222 581-4	601 222 684

Component Parts	Part no.
Core barrel head, complete WL66/50	601 222 504
Core barrel head with shut off valve, complete WL66/50	601 222 504-2
Free falling overshot for downward hole, complete	601 222 796
Lowering device for dry hole, complete	601 222 560
Ball joint, complete	601 222 462
Overshot for pumping in, complete	601 222 699
Stuffing box for pumping in, complete	601 222 690-X
Water swivel	501 012 143-2
Adapter, water swivel drill rod WL43 box x WL63 pin	501 222 765
Drill rod WL66/50, 63 x 750 mm	601 222 527
Drill rod WL66/50, 63 x 1500 mm	601 222 526
Drill rod WL66/50, 63 x 3000 mm	601 222 525
Cuff wrench WL66/50 inner tube	501 115 022-4

Component Parts	Part no.
Cuff wrench WL66/50 outer tube	501 115 033
Adapter drill rod WL63 pin x WL53/45 box	501 222 761
Adapter drill rod WL63 pin x WL AW pin	501 222 764
Adapter drill rod WL63 box x WL74 pin	501 222 788
Adapter WL63 box x 91 pin	501 222 786
Adapter WL63 box x 50 pin	501 222 782
Adapter WL63 pin x WL72 pin	501 222 787
Adapter WL63 pin x 42 pin	501 222 789
Adapter WL63 pin x 50 box	501 222 783
Tool kit, including:	601 222 764
- Hex key 2, 3, 4, 6 mm	
- Pin punch Ø3, Ø4, Ø8 mm	
- Hook wrench Ø38, Ø58 mm	
- Sleeve 11, 13, 14, 21, 22 mm, connection 1/2"	
- Long screwdriver	
- Tool bag	
Wrench for inner tube connection	601 222 590-2
Hand reamer for valve housing	300 025 325

11. Recovery kit - Component Parts 501 217 110

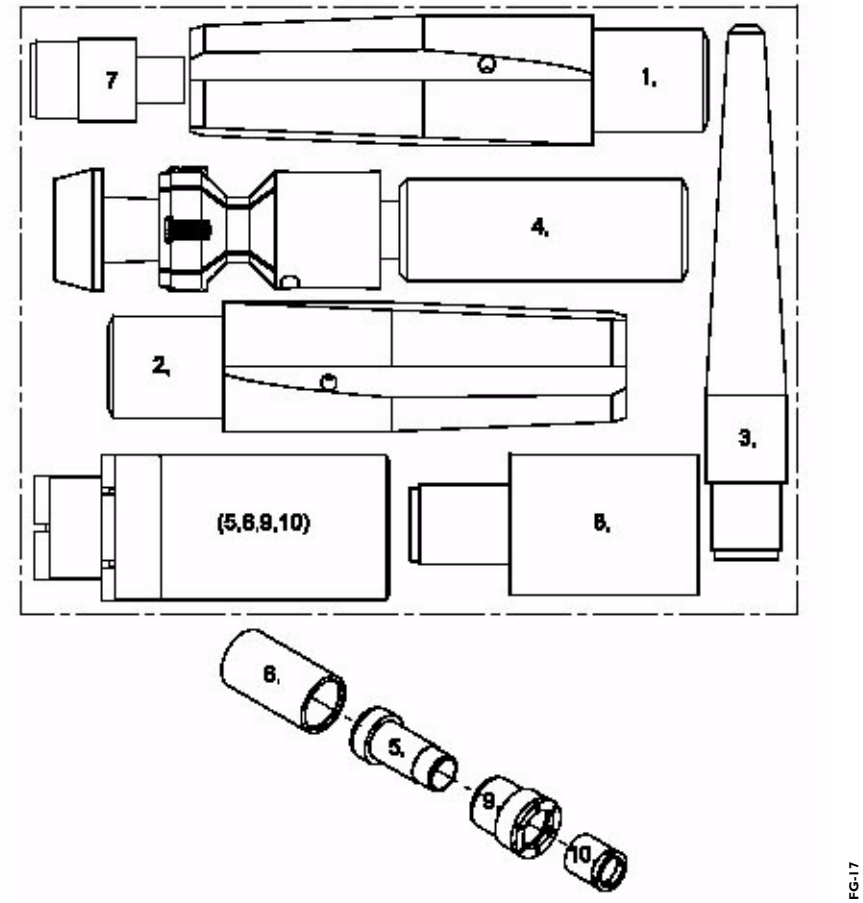


Table 19: Recovery kit 501 217 110

No.	Quantity	Part	Part no.
1	1	Drillrod tap WL63 RH connection 50 box	501 217 091
2	1	Drillrod tap WL63 LH connection 50 box	501 217 091-V
3	1	Lifter rod Ø42 mm RH connection 42 pin	501 217 007
4	1	Drillrod tap, expanded WL63 Drillrod	501 217 097
5	1	Extension tube cleaning bit	501 217 102
6	1	Sub WL63 box x Z 66 box	501 217 099
7	1	Sub 40/38 pin x M24 x 1.5 pin	501 222 741-4
8	1	Sub WL63 box x 50 pin	501 222 782
9	1	Drill bit Z 76	100 011 780
10	1	Drill bit 44/33	100 024 584
11	1	Tool bag	300 027 167

11.1 Recovery Operation

Every core driller will sooner or later experience the situation when drilling tools are either broken down or stuck in the hole. In such cases no drilling can proceed before the string is recovered.

11.2 Reasons of breakage

11.2.1 Wear

Drill rods and other exposed parts of the drill string wear against the hole wall during drilling. The cuttings in combination with flush water will also contribute to this wear. The rods will wear down to a point where they will not be able to resist the torques nor the longitudinal forces they are exposed to.

11.2.2 Fatigue

Drill rods and drill bits are constantly exposed to heavy loads and forces. The life of the equipment is limited by its fatigue resistance. If the nominal life of the drill string is exceeded the risk of breakage is rapidly increased. The life can be considerably reduced if the through faulty usage or maintenance. Heavy deviation of the drill holes also reduces life of the drill string due to the combination rotation/bending.

11.2.3 Getting stuck

Common cause of getting stuck:

1. Poor evacuation of cuttings. The cuttings from the bottom of the hole has to be transported to the surface by means of flush water. Too low flush speed makes the cuttings pack up against the drill rods which ultimately will result in getting stuck.
2. Leakage of the drill rod joints makes the flushing of the lower part of the drill string insufficiently flushed.
3. Cracks and fractures in the rock may result in loss of flush water. Hence the cuttings will cease to move upwards and it will sediment in the hole.
4. Cracks may also cause the drill bit to get stuck during drilling.
5. Lack of flush water due to faulty water pump or operator error. The drill string will get stuck in a matter of seconds due to melting of the drill bit.

SANDVIK

11.3 First thing to do when...

11.3.1 ...drill string is broken (cut off) down the hole

The drill string still attached to the drill unit is taken out of the hole. The breaking point is studied and suitable method is then chosen to recover the drill rods still down in the hole.

11.3.2 ...core barrel or drill bit is so badly stuck that they can not be removed by the drill unit

The tools stuck in the hole can be drilled (cleaned) away with drill bits.

Swiveled parts stuck in the hole will rotate and therefore it may sometimes be nessesary to pour cement down the hole prior to the cleaning.

11.3.3 …the whole drill string is stuck in the hole due to sedimentation or cave in

It may be possible to save the drill string by drilling over it with a larger dimension.

11.3.4 ...tools have fallen into the hole

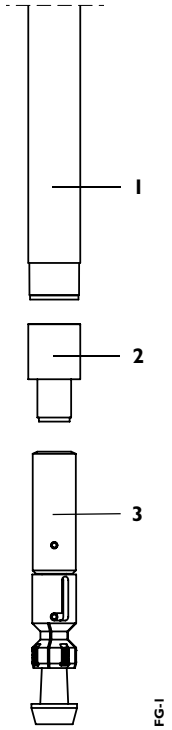
The two most common methods are to lower recovery tools — usually specially made for the specific purpose — or to drill away the tools.

11.3.5 …wire and hoses have snapped down the hole

It is usually possible to lower a ”spear” with hooks and rotate it. This will cause the hose/wire to twine around the spear.

11.4 Expanding recovery tap

The expanding recovery tap should be used if one of the drill rods is cut off in the hole. It is also an alternative when a drill string or parts of it is dropped down the hole and can not be “picked up” by remaining drill rods. The expanding recovery tap is a recovery tool for pulling up drill rods stuck in the hole *without rotation*. It should be not be used for unscrewing drill rods.

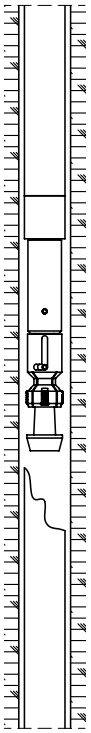


1. Assembly

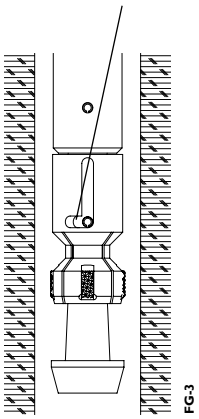
The expanding recovery tap is attached to drill rods of the same dimension as the string stuck in the hole. An adaptor shall be used in between the drill rod and the expanding recovery tap.

Table 20: Expanding recovery tap parts

No.	Part
1	WL Drill rod
2	Sub
3	Expanding recovery tap



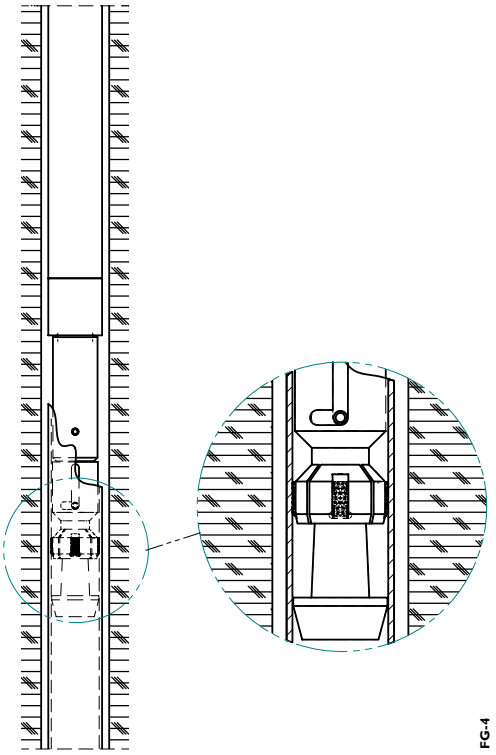
The expander is turned until the steering pin is in a position which will enable the expander to move up and down.



Lowering position

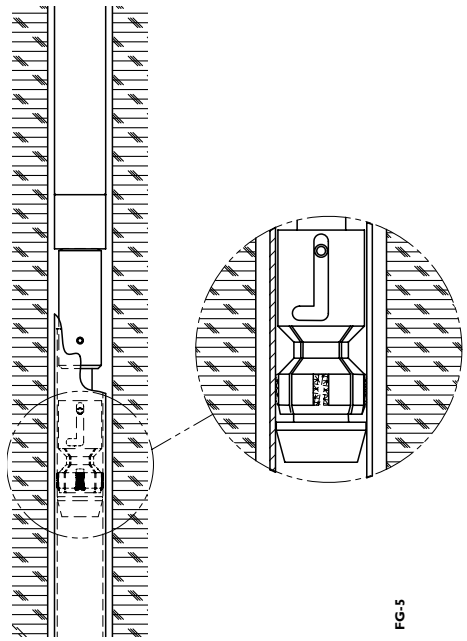
2. Lowering

Before the lowering of the tool, the expander should be fixed in “lowering position”.



3. Lowering towards the “lost” drill rods

The expanding recovery tap is inserted a maximum of 250 mm into the “lost” drill string.



4. Recovery of the “lost” drill string

When the recovery tap shaft is being pulled backwards it will make the lower part expand inside the “lost” drill string.

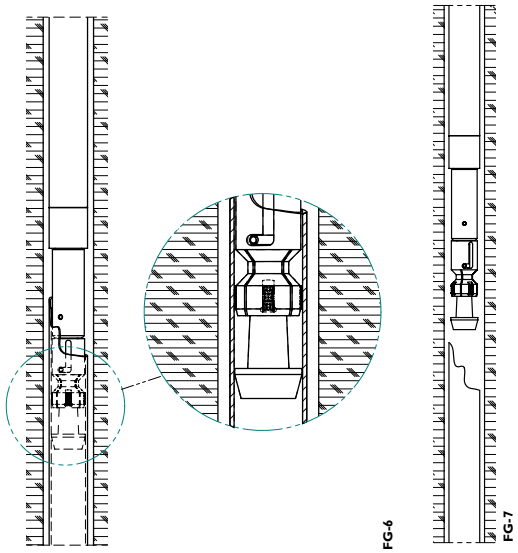
Table 21: Maximum pulling force without rotation

	WL46	WL56	WL66	WL76
Pulling force (kg)	8000	12000	20000	24000

Note

Do not rotate the drill string when the tool is being pulled back.

It may happen that the drill string is so badly stuck that the expander slides out of the drill string. In such a case another recovery tool should be used.

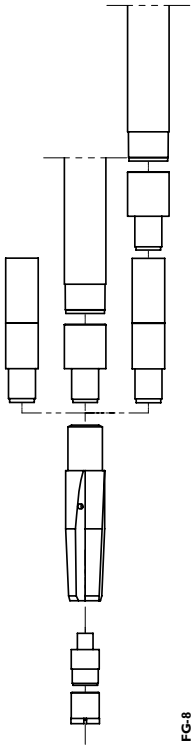


5. Release of the expanding recovery tap

If max allowed pulling force is reached, the expander should be released. This is done by pushing forward and turning the (fishing) drill string 30° RH-turn (see the picture to the left).

The expanding recovery tap can now be released and the next recovery alternative should be tried.

11.5 Recovery taps



The recovery tap should be used when a drill string is stuck or broken in the hole and when attempts to recover with the expanding recovery tap have failed. There are two types of recovery taps – one right hand threaded (RH) and one left hand threaded (LH). The right handed tap can be attached to three different set-ups of drill rods:

1. The existing drill string. With this set-up it is possible to screw the recovery tap only as far down the (stuck/broken) drill rod as the adaptor on top of the recovery tap permits. If the edge of the adaptor has reached the broken drill rod without the recovery tap gripping, another method of recovery must be used.
2. Using a smaller O.D. drill rod in between the existing drill string and the recovery tap. In this way the recovery tap is permitted to go deeper inside the (stuck/broken) rod.
3. Using a smaller O.D. drill string whose threads fit directly with the recovery tap.

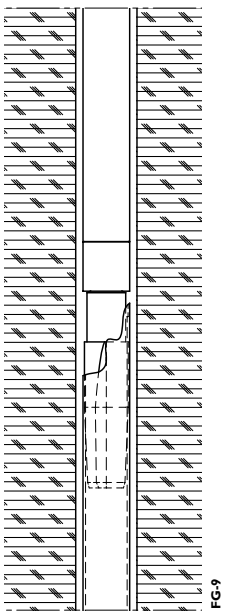
Table 22: Drill rod for the different systems

	WL46	WL56	WL66	WL76
Drill rod	33.5	33.5	50	50

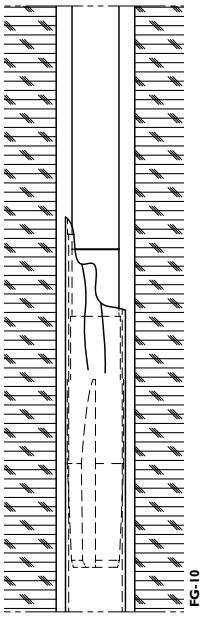
The RH recovery tap can be combined with a Z-cleaning bit to drill clean the hole from caved in rock.

The left handed (LH) tap is for recovering drill rods one by one when attempts to pull out the drill string have failed. These rods may not be stuck themselves, but joint with the drill rod or core barrel that is stuck deeper down in the hole. As the un-screwing is done with left hand rotation, the LH-tap requires a left hand (LH) threaded drill string. The LH tap can not be combined with the Z-cleaning bit that is included in the recovery kit.

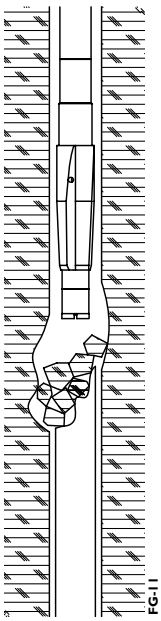
Alternative 1



Alternative 2 and 3

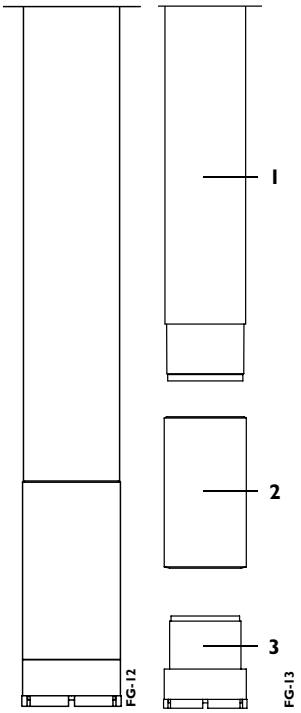


Recovery tap with Z-cleaning bit



11.6 Cleaning of drill hole

When tools are so badly stuck that they can not be recovered from the hole, a cleaning bit (Z) should be used to drill these tools away. In some cases it is necessary to pour cement in the hole to stop swivelled parts such as a core barrel head from rotating when the Z-bit is used.

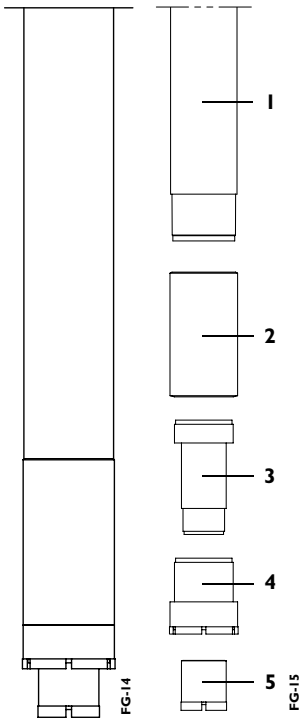


The cleaning bit is attached onto the WL drill rods by means of a sub.

If there is a problem with vibrations, there are specific drill rods (Z-drill rods) that can fitted directly on to the Z-bit.

Table 23: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Z-cleaning bit



The Z-cleaning bit can be combined with another drill bit if it becomes necessary to increase the cutting area to cut away the broken tools.

Table 24: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Extension rod for TV Z bit
4	Z cleaning bit
5	TV Z bit